



## **2005 GREENHOUSE GAS EMISSIONS INVENTORY**

Brendan Reed

Michael Meacham

Roman Partida-Lopez

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### **SUMMARY**

Since the early 1990s, Chula Vista has been engaged in multiple climate change forums including the United Nations Framework Convention on Climate Change and the Kyoto Protocol Conference. As a result of this initial involvement, the City was the first local government with fewer than 1 million residents to become a founding member of ICLEI – the International Council for Local Environmental Initiatives – and its Cities for Climate Protection campaign. Through the campaign, Chula Vista adopted and implemented a Carbon Dioxide (CO<sub>2</sub>) Reduction Plan which assessed its 1990 greenhouse gas (GHG) emissions and outlined actions to decrease emissions by 20% by 2010.

The 2005 GHG Emissions Inventory is the first formal evaluation of the City's progress in reaching its emissions goals. The 2005 inventory indicates that Chula Vista's annual citywide GHG levels have increased by 35% since 1990 due primarily to residential growth. While this represents a significant challenge in reaching the City's 2010 community emissions goal, the City did make significant progress in reducing annual per capita emissions by 17% between the two inventory years and avoiding nearly 200,000 tons of GHG emissions annually. In addition, GHG emissions from municipal sources decreased by 18% mainly due to energy-efficient traffic signal retrofits.

To reach the community and municipal emission reduction targets outlined in the CO<sub>2</sub> Reduction Plan, the City must decrease annual emissions by at least 389,963 and 377 tons, respectively.

### **INTRODUCTION**

The City of Chula Vista's Greenhouse Gas (GHG) Emissions Inventory for calendar year 2005 was compiled and calculated using the ICLEI Cities for Climate Protection protocol and its supporting software (Version 1.1). The protocol provides local governments with an opportunity to collect and analyze their community's GHG emissions in a cost-effective manner without third-party consultants to verify the data. The inventory provides the supporting data and tools for shaping policy and regulations that address the City's climate change goals. However, it should be noted that without the third party verification, required by the California Climate Action Registry, the protocol cannot be used to satisfy state-mandated emission caps or for carbon trading. The State is promoting carbon trading as a financial incentive to encourage entities to reduce emissions and to help California meet new GHG emission targets being established by the California Air Resources Board. Carbon reductions on the Chicago Climate Exchange (CCX) are currently trading at approximately \$3.50 per metric ton.

The ICLEI Protocol separates emissions into two major analyses, community and municipal. The community analysis represents the quantity of GHG emissions produced throughout the entire City from both public and private sectors. The municipal analysis only represents

emissions from City facilities and operations. In both analyses, the protocol evaluates emissions from three main parameters - energy consumption, transportation and waste. It is important to clarify that these data parameters are based solely on end use or net results. For example, recycling program improvements would be reflected in the data by lower annual solid waste disposal tonnage not increased diversion rates. Similarly, the City's emissions from electricity are calculated based on the total kilowatts used, not the kilowatts saved in City programs or the emissions output of the South Bay Power Plant. Although there are six GHGs outlined in the Kyoto Protocol – carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>) – the ICLEI protocol calculates emissions based on Equivalent CO<sub>2</sub> or eCO<sub>2</sub> which allows emissions of different strengths to be added together. For example, one ton of methane emissions is equivalent to 21 tons of carbon dioxide (or eCO<sub>2</sub>) in global warming potential.

A major reason for performing a 2005 GHG emissions inventory was to assess the City's progress in achieving its emission reduction targets. In 2000, the City approved a CO<sub>2</sub> Reduction Plan which outlined 20 actions the City could undertake to help reach its target of 80% of 1990 emission levels by 2010. Because a different protocol was originally used in calculating 1990 levels, the raw data was re-entered using the current ICLEI protocol and software. Although this has modified 1990 emission values, it creates an opportunity to more accurately compare 1990 and 2005 levels and to more effectively gauge the City's progress. ICLEI staff has confirmed this approach as the more accurate methodology.

## RESULTS

With the assistance of ICLEI, and under the guidance of the California Climate Action Registry, City staff collected raw data from a number of municipal and external sources, including

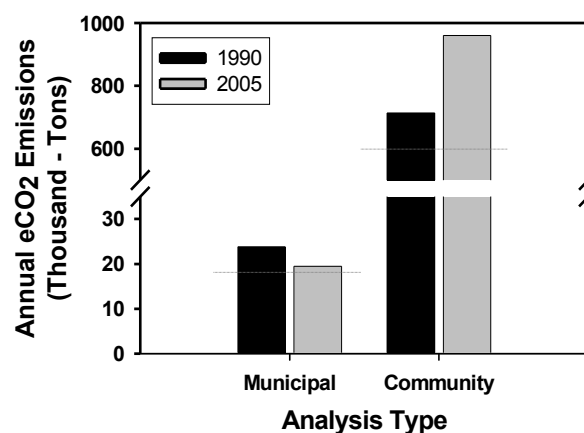
Parameter	Analysis	Source	Notes
Energy	Community	SDG&E	South Bay Power Plant & Main St. Peaker Plant were not included in Industrial Sector's natural gas totals in order to avoid double counting emissions
	Municipal	SDG&E	Energy consumption was categorized by buildings, outdoor lighting, and wastewater
Transportation	Community	SANDAG	Average weekday Vehicle Miles Traveled (VMT) was extrapolated from 2004 data (excluding freeway traffic) and converted to Annual VMT
	Municipal	City Fleet	Fuel consumption totals include transit and equipment use
Waste	Community	County of San Diego	Data includes waste disposal from Chula Vista residents and businesses at all County landfills
	Municipal	Allied Waste Services	Data includes trash hauled by Allied Waste Services and by City staff

**Table 1:** Data sources for community and municipal emissions analyses.

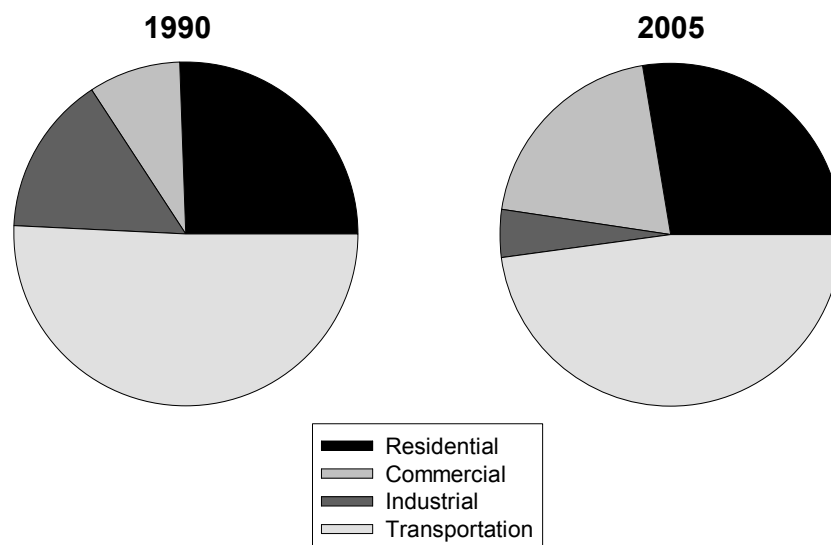
SANDAG, San Diego Gas & Electric and the Public Works Department (Table 1). In most cases, 2005 data was directly available from these sources. However, it was necessary to extrapolate 2005 data from 2004 values in some limited cases. Standard ICLEI software defaults were utilized for emission co-efficients, electricity resource mix, and waste type percentages.

### *Community Inventory*

In 2005, community GHG emissions from Chula Vista totaled 960,639 tons eCO<sub>2</sub> (Table 2, Figure 1). The sector with the greatest amount of emissions (approximately 48%) was transportation or mobile sources (Figure 2). The residential sector was the second highest source producing about 28% of total community emissions from energy use, followed by the commercial (20%) and industrial (4%) sectors. Because of the high methane recovery rates at County landfills, the community did not have significant emissions from solid waste disposal.



**Figure 1:** Total GHG emissions for 1990 and 2005 in community and municipal analyses. Dashed line represents 2010 reduction target.



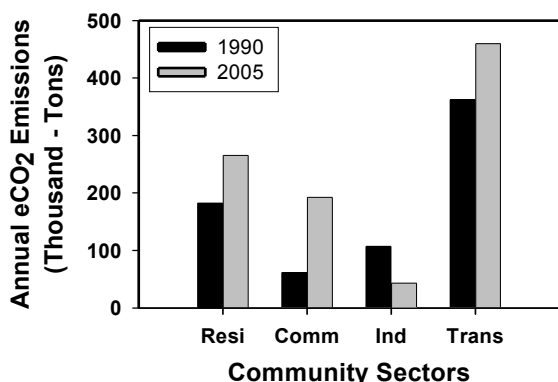
**Figure 2:** Sector contributions to community GHG emissions in 1990 and 2005.

**CITY OF CHULA VISTA - COMMUNITY ANALYSIS**

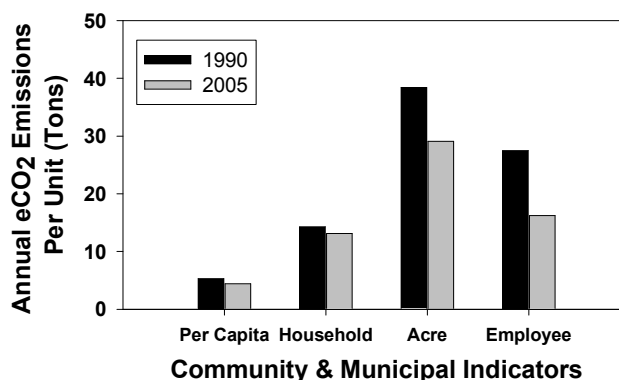
Metrics					Annual Greenhouse Gas (GHG) Emissions (eCO <sub>2</sub> - Tons)				
		1990	2005	% Change			1990	2005	% Change
Population		135,136	217,543	61%	Per Capita		5.3	4.4	-17%
Housing Units		49,849	73,115	47%	Per Housing Unit		14.3	13.1	-8%
Land Area (Acres)		18,558	33,024	78%	Per Acre		38.4	29.1	-24%
Annual Vehicle Miles Traveled (VMT)		465,342,150	699,180,400	50%	Transportation		362,076	459,667	27%
Energy Use (MMBtu)	Residential	2,438,280	3,416,724	40%	Energy Use	Residential	182,274	265,555	46%
	Commercial	767,716	2,305,220	200%		Commercial	61,755	192,320	211%
	Industrial	1,342,551	485,504	-64%		Industrial	107,240	43,097	-60%
	Total	4,548,547	6,207,448	36%		Total	351,269	500,972	43%
Solid Waste (Tons)		179,986	217,459	21%	Solid Waste		0	0	0%
					Total GHG Emissions		713,345	960,639	35%
					20% GHG Reduction Goal			570,676	
					Reductions Needed To Reach Goal			389,963	

**Table 2:** Summary of community GHG inventory metrics and emission levels for 1990 and 2005.

Chula Vista's 2005 GHG emissions levels were 35% greater than 1990 levels. There were overall emissions increases in all sectors, except industrial (Figure 3). The City's transportation and residential sector emissions increased by approximately 27% and 46%, respectively, while emissions from commercial businesses increased by 211% from 1990 to 2005. The industrial sector emissions had a 60% reduction between the two inventory years from 107,240 to 43,097 annual tons most likely due to more accurate energy tracking in 2005 (see page 7). Similar to the 2005 inventory, emissions from solid waste disposal at County landfills were not significant in 1990.



**Figure 3:** Total community GHG emissions for 1990 and 2005 by sector.



**Figure 4:** Per capita, household, acre and employee contributions to GHG emissions in 1990 and 2005.

Although there was an increase in total community emissions, the rate of GHG emissions per person, per household and per acre decreased (Figure 4). The per capita emissions rate was lowered 17% from 5.3 to 4.4 tons annually. Per household emissions were reduced 8% from 14.3 to 13.1 tons, while emissions per acre decreased 24% from 38.4 to 29.1 tons. Nonetheless, in order to achieve the City's 2010 GHG reduction target, annual community emissions would be required to be reduced by at least an additional 389,963 tons eCO<sub>2</sub>.

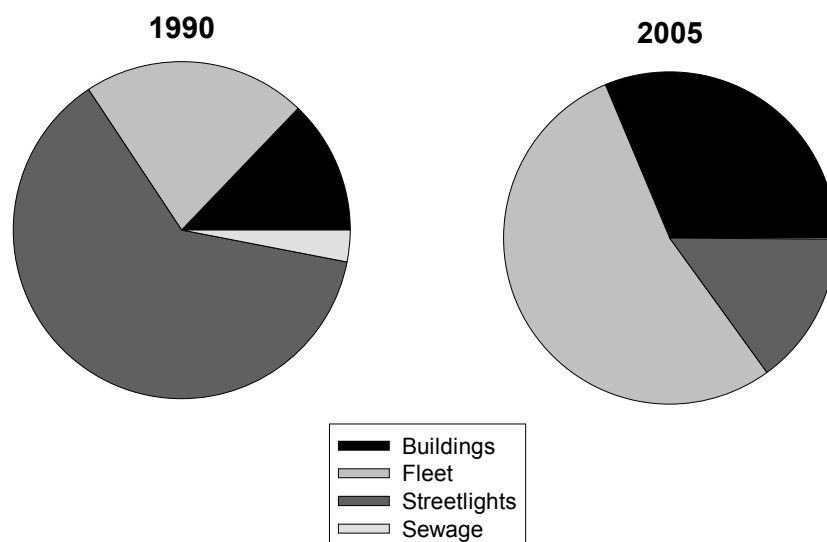
### *Municipal Inventory*

Chula Vista's 2005 municipal GHG emissions were 19,432 tons eCO<sub>2</sub> (Table 3, Figure 1). Similar to the community analysis, the majority of municipal emissions were from transportation sources representing 54% of total emissions (Figure 5). Energy use for building and outdoor lighting created 31% and 15% of total emissions, respectively. Emissions from sewage and solid waste operations were not significant in the 2005 municipal analysis.

CITY OF CHULA VISTA - MUNICIPAL ANALYSIS

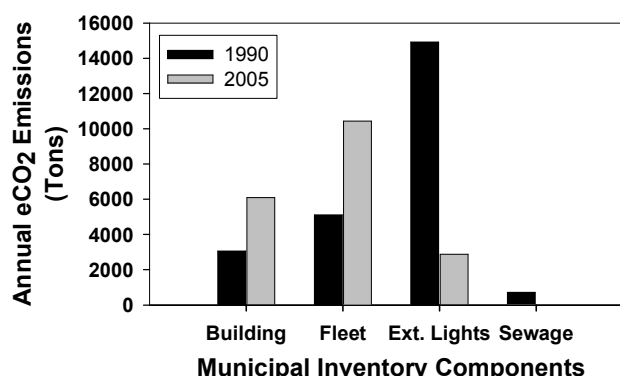
Metrics					Annual Greenhouse Gas (GHG) Emissions (eCO <sub>2</sub> - Tons)						
		1990	2005	% Change			1990	2005	% Change		
Employees		866	1,198	38%	Per Employee		27.5	16.2	-41%		
Vehicle Fleet Fuel Use (Gallons or Equivalent)		478,344	1,102,819	131%	Vehicle Fleet		5,115	10,432	104%		
Energy Use (MMBtu)	Buildings	35,527	70,790	99%	Energy Use	Buildings	3,057	6,085	99%		
	External Lights	147,100	27,780	-81%		Energy Use	External Lights	14,923	2,888	-81%	
	Sewage	7,122	257	-96%			Energy Use	Sewage	723	27	-96%
	Total	189,749	98,827	-48%				Energy Use	Total	18,703	9,000
Solid Waste (Tons)		5,400	6,603	22%	Solid Waste				0	0	0%
Total GHG Emissions		23,818	19,432	-18%	20% GHG Reduction Goal					19,055	
Reductions Needed To Reach Goal			377								

**Table 3:** Summary of municipal GHG inventory metrics and emission levels for 1990 and 2005.



**Figure 5:** Sector contributions to municipal GHG emissions in 1990 and 2005.

When compared to 1990 levels, GHG emissions from municipal operations decreased by 4,386 tons or 18% and emissions levels per City employee (permanent, full-time) decreased 41%. This reduction was mainly caused by lower energy consumption in the external lighting sector (Figure 6). Emissions from external lighting energy use (includes streetlights and traffic signals) decreased 81% from 14,923 tons to 2,888 tons due to an energy-efficient retrofit program implemented by the Engineering Department, Public Works Department and the Environmental Resource Manager in the mid-1990s. Sewage sector emissions also decreased by 96% resulting in only 27 tons eCO<sub>2</sub> being produced in 2005. However, this reduction is most likely due to differences in how pump station energy meters were segregated out of the dataset. Both building and transportation sectors approximately doubled their 2005 emissions compared to 1990 levels. Similar to the 2005 inventory, emissions from solid waste disposal at County landfills were not significant in 1990.



**Figure 6:** Total municipal GHG emissions for 1990 and 2005 by sector.

To achieve the City's 2010 GHG reduction target, annual municipal emissions would be required to be reduced by at least an additional 377 tons eCO<sub>2</sub>.

## DISCUSSION

Since the mid-1990s, the City of Chula Vista has been implementing programs and policies to lower GHG emissions from municipal operations and the community through its CO<sub>2</sub> Reduction Plan (Table 4). Of the Plan's 20 actions, eighteen measures have been implemented. Twelve of these measures were focused on reducing community-level emissions. These actions dealt with lowering the community's dependence on personal motorized vehicle use and reducing energy

demand in new construction through “Smart Growth” land use and planning and voluntary energy efficiency programs. Despite successfully incorporating these “Smart Growth” measures into many new neighborhoods’ design and construction, overall GHG emissions from the Chula Vista community increased from 1990 to 2005 in most sectors. Only industrial sector emissions were reduced during this time period. However, because commercial and industrial energy use could not be segregated in the 1990 inventory, their individual emission contributions had to be estimated. Therefore, reductions in industrial sector emissions are most likely due to more accurate energy consumption tracking in 2005. If commercial and industrial emission levels are combined in each inventory year, there was an overall 39% increase in emissions from the combined sectors between 1990 and 2005.

Emissions Reduction Focus	Measure #	Description	Status
Municipal	1	Purchase of Alternative Fuel Vehicles	Ongoing
	2	Green Power Purchases	Suspended/Ongoing
	3	Municipal Clean Fuel Demonstration Project	Ongoing
	5	Municipal Building Upgrades & Trip Reduction	Ongoing
	16	Traffic Signal & System Upgrades	Ongoing
	19	Municipal Life-Cycle Purchasing Standards	Ongoing
Community	4	Telecommuting & Telecenters	Closed
	6	Enhanced Pedestrian Connections to Transit	Ongoing
	7	Increased Housing Density Near Transit	Ongoing
	8	Site Design w/ Transit Orientation	Ongoing
	9	Increased Land Use Mix	Ongoing
	10	Green Power Public Education Program	Ongoing
	11	Site Design w/ Pedestrian/Bicycle Orientation	Ongoing
	12	Bicycle Integration w/ Transit & Employment	Ongoing
	13	Bicycle Lanes, Paths, & Routes	Ongoing
	14	Energy Efficient Landscaping	Ongoing
	15	Solar Pool Heating	Not Implemented
	17	Student Transit Subsidy	Not Implemented
	18	GreenStar - Energy Efficient Building Program	Ongoing
	20	Increased Employment Density Near Transit	Ongoing

**Table 4:** Current implementation status of the Chula Vista CO<sub>2</sub> Reduction Plan’s 20 Actions.

From 1990 to 2005, the City experienced tremendous growth both in population and geography. Population increased by 80,000 new residents or 61%, and the number of households increased to 73,115 units. The City’s land area also expanded by 78% with the incorporation of 13,037 additional acres. Despite this growth, there was significant progress at the community-level in reducing GHG emissions on a per capita, per household and per acre basis. It is estimated that if the City had not implemented the CO<sub>2</sub> Reduction Plan, 2005 emissions could have totaled over 1.1 million tons eCO<sub>2</sub> (192,000 tons or 20% above actual 2005 emissions).

Six measures under the CO<sub>2</sub> Reduction Plan were adopted to target emissions from municipal operations and facilities. Again, the measures were primarily focused on lowering fossil fuel use and improving energy-efficiency. The City also had the most direct control over implementing these measures through its policy requirements, program budget appropriations and capital

improvement projects. As a result, the City has made significant gains in reducing GHG emissions in its own facilities and operations from 1990 to 2005. The largest emissions reduction was from upgrading traffic and pedestrian signals with LED lamps. Conversely, emissions from building energy use and fleet fuel consumption increased despite improvements to building energy-efficiency and expanded alternative fuel and energy use. Although emissions from municipal sources only comprised about 1% - 2% of the total community-level emissions in both inventory years, the City's success in achieving reductions is a notable accomplishment and demonstrates how targeted measures can produce significant CO<sub>2</sub> reductions. In addition, these measures required minimal or no initial investment and continue to produce long-term financial savings for the City.

## **NEXT STEPS**

The 2005 GHG emissions inventory report is the first step in the City's effort to assess its emissions reduction progress and to redefine policies and programs required to reach its 2010 reduction commitment. With this report, the Conservation & Environmental Services Department has the information needed to work collaboratively with other City departments, community groups, residents and businesses to develop a list of options and recommendations that the City could pursue to attain its 2010 GHG reduction goals. The following list, adapted from ICLEI's Cities for Climate Protection program, provides examples of effective GHG reduction programs and policies implemented by local governments and may serve as a reference for future City actions. It should be noted that Chula Vista has initiated some of these measures already to varying extents.

### **BUILDING-RELATED ENERGY**

#### **Municipal Building Energy Efficiency & Conservation**

- Install energy-efficient exit sign lighting
- Perform energy-efficient lighting retrofits
- Install occupancy sensors
- Perform heating, cooling and ventilation system retrofits (e.g., chillers, boilers, fans, pumps, belts, fuel-switching from electric to gas heating)
- Install green or reflective roofing
- Improve water pumping energy efficiency

#### **Community Building Energy Efficiency & Conservation**

- Launch an "energy efficiency challenge" campaign for community residents
- Adopt strict residential or commercial energy code requirements
- Implement a low-income weatherization program
- Promote the purchase of ENERGY STAR appliances from Chula Vista businesses
- Promote participation in a local green business program
- Install solar water heating at community swimming pools
- Promote water conservation through technological and behavioral modification
- Implement district heating and cooling
- Implement time-of-use or peak demand energy pricing
- Install energy-efficient cogeneration power production facilities

#### **Outdoor Lighting**



- Install energy-efficient streetlights (e.g., high pressure sodium, LED)
- Decrease daily operation time of streetlights

### **Renewable Energy**

- Install solar panels on municipal facilities
- Promote or require community clean energy use through on-site renewable technologies
- Offer incentives to foster solar PV installations in the community
- Use Community Choice Aggregation to fund and promote the transition to renewable energy

## **TRANSPORTATION**

### **Vehicle Fuel Efficiency**

- Retire older, inefficient fuel vehicles
- Purchase fuel efficient (e.g., hybrid) and/or smaller fleet vehicles
- Utilize fuel-efficient vehicles (e.g., scooters) for parking enforcement
- Promote community purchases of compact and hybrid vehicles

### **Alternative Fuels**

- Utilize biodiesel in municipal fleet and City contractor vehicles
- Utilize ethanol in municipal fleet and City contractor vehicles
- Utilize electric vehicles in municipal and City contractor fleets
- Utilize compressed natural gas in municipal and City contractor fleets
- Utilize hydrogen or fuel cell vehicles in municipal fleet
- Initiate a community biodiesel purchasing co-op or fueling station

### **Trip Reduction / Transportation Demand Management**

- Encourage car-pooling or van-pooling by municipal employees and City contractors
- Encourage telecommuting by municipal employees and City contractors
- Encourage use of mass-transit by municipal employees and City contractors
- Promote car-pooling, telecommuting and the use of mass-transit by community members
- Provide high school students with complementary bus tickets
- Expand local or regional bus service in range and/or frequency
- Install new light rail systems
- Implement bus rapid transit programs
- Expand community bicycle infrastructure (e.g., dedicated bicycle lanes, additional bicycle parking spaces)
- Provide free bicycles for public use
- Institute a “safe routes to school” program

## **LAND USE**

- Institute growth boundaries, ordinances or programs to limit suburban sprawl
- Target new development to brownfield sites
- Foster downtown neighborhood development
- Plant shade trees